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no. 29

ALTGELD HALL STACKS

THE INTEROCEANIC CANAL
OF MEXICO

DESCRIPTION

WRITTER BY

S. A. DE CARDONA,

MEMBER OF THE COMPANY FOR CONSTRUCTING THE INTEROCEANIC CANAL
OF MEXICO.

MEXICO
TIP. J. I. GUERRERO Y Cª SUCS. DE F. DIAZ DE LEON
Esquina del Cinco de Mayo y Callejón de Santa Clara.
1903.

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No. 29

THE INTEROCEANIC CANAL

OF MEXICO.

STUDY PRESENTED

BY

S. A. DE CARDONA,

Member of the "Initiatory Company of the Interoceanic Canal of México"

UPON THE REPORT WRITTEN

BY COLONEL

ANGEL M. CARRILLO DE ALBORNOZ

AND ENGINEER

JUAN PABLO DEL RIO

REGARDING SAID CANAL.

Assured to be printed by the afore said Company.

MÉXICO
TIP. J. I. GUERRERO Y CIA., SUCS. DE FRANCISCO DIAZ DE LEON.
Cinco de Mayo y Callejón de Santa Clara
1903

REPORT on the Surveys made for the Mexican "Interoceanic Canal" from the Coast of Tabasco on the Gulf of Mexico, to Tehuantepec on the Pacific Ocean, by Antonio Linares, C. E.

Colonel Angel M. Carrillo de Albornoz, and Mr. Juan Pablo del Río.

DEAR SIRS:

As a result of the commission you were pleased to give to me for a study of your project for the location of a Mexican Interoceanic canal, I now have the pleasure of presenting my report together with the corresponding plans.

The zone that I surveyed in connection with this study, extends over the territory of the States of Tabasco and Chiapas, between the Gulf of Mexico and the Pacific Ocean, and extends over a length of nearly two hundred and seventy-five kilometres.

Although the line I have run over is not the one that presents the shortest distance across, as on the Isthmus of Tehuantepec, it possess, on the other hand, the advantage of being more accessible in its central parts, as the height of the mountain which has to be overcome hardly reaches 170 metres, whilst on the Isthmus it is not less than 350 to 400 metres. On the other hand, it being necessary to utilize the natural currents and the easier grades in order to render navegation feasible, we must add to the advantages above ennumerated, the very great advantage of the water supply to the projected canal through the large rivers that could be utilized and which carry more than sufficient water for its necessities. This opinion is supported by the fact, that the River Mezcalapa at present gives rise to other four or six rivers which, in themselves, constitute a real hydrographic net. If these waters could be confined to one sole channel which would be the interoceanic canal, the thing would be comparatively easy and you would have resolved this most important problem, that, up to the present date, nobody has been able to decide, and for whose successful execution, you ought to be entirely satisfied.

As I have above stated, two conditions are necessary for the practical execution of a connection between the two oceans by means of a navigable canal; firstly, that you should be able to count on two water courses, each running to one of the oceans, and secondly, that the volume of water in these streams should be sufficient for the desired purpose.

That part of Isthmus which you desire to utilize for your projected work, presents two hydrographic basins. This division of the waters occurs in the mountainous region whose nucleus is found in the Cordillera de Cinco Cerros, that spreading in different directions, is nothing more than the backbone of the range, that coming from the States of Oaxaca and others, continues outside of the national territory towards the republics of Central America. As special eminences of this part of the range, I may especially mention the "Cerro Atravesado," "Cordillera de Tres Picos," and "Cinco Cerros" already mentiond. All this group of mountains is situated to the south of the Isthmus, and the northern region can hardly be called mountainous, as it is formed of plains with a gentle and uniform slope towards the Gulf of Mexico. I cannot say the same as regards the southern side, where the ground is more broken and the fall to the Pacific coast is heavier.

The River Mezcalapa, which lower down is called the River Grijalva, rises from a great number of streams. To the north of the mountain chain called "Tres Picos," there are not less than twenty small streams, that forming a net of waterways, go on increasing in volume until they all meet at the point denominated "Mal Paso," on the eastern slope of "Cinco Cerros," and from this point on, the river takes the name of Mezcalapa. It continues its course northward and passing by way of Huimanguillo, it continues towards the east, and dividing into several streams, it runs towards the Gulf along a very broad channel and discharges over the bars of Tabasco, "Chiltepec," "Bocas" and others.

The lake of Santa Ana which is close to the Gulf of Mexico, is directly fed by the River Santa Ana that rises about 18 kilometres from Huimanguillo, and is also fed by the north and south prolongation of River Mezcalapa. If the Mezcalapa were conected with the river Santa Ana, both would become easily navigable and the territory between the two oceans connected by a good waterway.

The current to the south is still more easy to find, as the River Ostuta which discharges into the "Laguna Inferior," rises to the southwest of the "Cerro Atravesado," at a point only forty kilometres distant from the River Mezcalapa. This distance is really the only difficulty in connecting the two currents to be utilized. Nevertheless, in searching for a point on the River Mezcalapa which could be connected with the sources of the River Ostuta, we were able to resolve the problem of shortening as far as possible the distance, by discovering the lowest grade, which would be of 0.282 metres per cent. and thus avoiding the higher ground and obtaining economy in the construction. As the River Ostuta has too much fall for navigation, it would be necessary to canalize it and so diminish the fall whilst we utilized its entire volume of water as well as that proceeding from the sources of the Rivers Corte and Uspanapa, that run between the Ostuta and Mezcalapa. The deepest cutting that it would be necessary to make on the River Ostuta, as well as on the canal projected to connect it with the Mezcalpa, will have a height of 155 metres at place called "La Cima," and from this height it would diminish sensibly until near "Ixhuatlan," near the "Laguna Inferior." In the River Mexcapala, little earth work would be required, as the works would be almost exclusively confined to the canalization and control of the river.

The open canal betwen the Rivers Ostuta and Mezcalapa would be convenient up to a certain point, but costly on account of the enormous quantity of material to be moved, and therefore could be substituted by a tunnel of the same length, about forty kilometres. This may appear an impracticable idea, but there is nothing strange in it in view cf the present conditions of working, the application of powerful resources, such as dynamite and electricity, besides many others that are now employed in modern construction and that render the realization of these great works comparatively easy in practice.

Whether a tunnel or a canal is decided on, the waters would divide at that point on the River Mezcalapa from which the canal would start to connect with the Ostuta. This central point will be the place in which large sluice gates will be operated by electric motors to distribute the waters of all the affluents of the Mezcalapa, and direct them in one or other direction.

With respect to the navigation of the "Laguna Inferior" and Laguna "Santa Ana" there is nothing to say, as they are both perfectably navigable. As regards the connection between the River Mezcalapa and the Santa Ana, it can be carried out by leading the waters of the former through a canal fifteen kilometres long which would discharge into the latter.

In order to terminate this short report, I must inform you that during my expedition, which lasted from the 3rd of January to the 15th of February of this year, I had occasion to make some slight observations of the geological formation of the country, which in every way strengthened my opinion of the facility presented by the ground for the execution of the works, as without being of a hard basaltic rock, except with rare exceptions and for short distances, the country in general presents different strata of clay soil with tufas, in which the silicates and conglomerate feldspars predominate, and would unquestionably allow of the excavation of canals, with steep slopes if necessary.

The sketch that I present with this report was made with the assistance of instruments such as are commonly used in military topography, amongst which was a hand level with an Egault clinometer to determine the slopes and small differences of level, an aneroid barometer, and a hipsometer that I use with the Babinet formula for determining great differences of level; a telemeter with fixed threads and known constant and a perambulating wheel with its corresponding pedometer for measuring distances, and also a Kabter prismatic compass for taking angles and magnetic bearings.

On giving you my sincere thanks for having comissioned me to carry out this delicate work; I again congratulate you on the happy idea, that no doubt you will carry into practice, and which will imply an immense honor for the Mexican Republic, as well as for its hard working and intelligent authors.

Mexico, March 5th, 1902.

ANTONIO LINARES.

THE MEXICAN INTEROCEANIC CANAL

INTRODUCTION

Mexico, a country generously endowed by Nature with riches of all kinds, has also been designated as the one upon whose virgin and prodigious soil, the solution of the great problem of interoceanic maritime communication shall be effected at no distant date. So long a time has it cost to arrive at this conviction, and through such a series of difficult reconnoisances and extended studies, that to merely think upon it fatigues the spirit; but light appeared at last clearing away the darkness that covered the mysterious past, and to-day there exists no doubt whatever as to the facility of constructing a canal without a single lock in Mexican territory, through which may pass from sea to sea even the heaviest laden vessels from all the countries of the globe.

Then this privileged country will no longer solely inspire interest by reason of its ancient but interesting and grandiose monuments, unique remains of remote civilizations, whose origin is lost in the darkness of mystery; by the almost incredible history of its conquest; by its typical and picturesque costumes; by its incomparable landscapes; its fertile climate and its innumerable sacrifices to constitute itself a free and sovereign nation; nor will it only attract the regards of the world on account of its inexhaustible deposits of precious metals, the variety and richness of its other natural products, the extensive field that it offers for the profitable investment of capital, the rapid manner in which it wends its way toward aggrandizement, the stable peace that it enjoys, and the contingent which it lends today to the work of human prosperity; but also, because it will be across its rich domains, and at no distant date, much sooner than through any other of the American isthmuses, that the great commercial traffic of the two worlds will pass.

All expeditions organized to this end, since the time of the Conquest by the Spaniards up to a very recent date, failed in their efforts completely; but the dense veil which had resisted the investigating glance of all those explorers, during so many generations, has ceded to the tenacious and continued efforts of two men, exceptional not only for their force of character, but also for their noble ambition to contribute in an efficacious manner to the wealth and aggrandizement of their country. Those fortunate men, to whom was reserved so legitimate a glory, one to which so many have aspired, are the worthy Colonel Angel M. Carrillo de Albornoz and Engineer Juan Pablo del Río, who have already rendered in divers manners most important services to Mexico.

Both of them being men well acquainted with the deceptions and disappointments of life, upon seeing their long labors rewarded by so valuable a discovery, feared that others might take advantage of what cost them such enormous sacrifices, and they resolved to continue their studies in the greatest secrecy. They labored on, overcoming all storts of obstacles with unchanging faith; they reconnoitred, step by step, the virgin and indescribable lands of Tabasco, Chiapas and Oaxaca, situated near the zone that the Mexican International Canal must pass, and daring the danger of being devoured at any moment by the ferocious beasts which abound in those sylvan depths of savage beauty, they took measurements, made approximate calculations, drew up plans and profiles, and dreamed, lulled by the song of birds that in infinite number animate those forests of richest and rarest woods, of the inmense benefits, which Mexico in particular and the whole world in general, would soon enjoy by reason of that maritime communication to which they were devoting their untiring efforts.

And what a just satisfaction they must have felt in thinking upon all this, and upon the luster their names were to receive for the grandiose result of their studies!

From the time of the Conquest, a natural pass was eagerly sought, which might communicate the two oceans; and when the conviction was reached that there existed none, but more particulary so since the increase in commerce has rendered more necessary that maritime communication, many are the studies that have been made upon the various isthmuses of the Contienent, for the purpose of constructing the desired Interoceanic Canal, without being able to realize it so far.

The isthmuses of Darien and Panamá have attracted special attention on account of their narrowness, for the width of the latter is less than 50 miles; but as it has been fully demonstrated, by the reconnoissances made, the narrower that those orographic necks are in our Contient, the greater are the serious obstacles encountered there.

The Isthmus of Nicaragua has a much greater width, about 183½ miles, but lakes Nicaragua and Managua and San Juan River form a natural means of communication through a great portion of it.

The Isthmus of Tehuantepec has approximately the same width as that of Nicaragua, but is also notably reduced by the Coatzacoalcos River and the Superior Lagoon. It is not across this part of the isthmus, however, that our projected canal will be laid, as will be seen later on.

When some years ago the European Geographical Congress assembled in Paris, at the suggestion of M. Ferdinand de Lesseps, for the special purpose of studying the question of isthmuses in America and establishing through some one of them maritime communication between the Atlantic and Pacific, Mexico sent her representatives for the purpose of seeking to obtain the preference for the Tehuantepec Route, and this isthmus was the first to occupy the attention of the Conference, in which figured some of the most notable engineers of the world; but they dedicated their studies to the most difficult part of our isthmus, desiring to utilize the waters of the Coatzacoalcos River, and having arrived at the conclusion that the construction of the canal through this part would call for 128 locks and fourteen days to cross it, the idea was abandoned completely.

They then studied the Isthmus of Nicaragua; a canal constructed in that territory would require 28 locks and a space of four days to cross it, and this isthmus was also therefore rejected.

The Isthmus of Darien was then considered, and having encountered here the necessity of boring a tunnel of 7 kilometers in length for vessels, and as the principal ship owners resolved not to pass through any such a tunnel with their ships, this new study was rejected in turn, and then they fixed upon the Isthmus of Panamá in a definite manner, as the only place possible for the construction of the canal on a level.

M. Ferdinand de Lesseps, who had already successfully effected the opening of the Suez Canal, recommended the construction of the Interoceanic Canal in America across the Isthmus of Panamá, calculating that this was the one offering least obstacles; and, thanks to an opinion so well authorized, a powerful company was soon formed that commenced labor upon that gigantic work. It seems almost useless to say any thing here as to the results of that great effort which cost so many millions of dollars, thousands of lives and the unjust condemnation of one of the most worthy men of France. All the world knows that there resulted mothing more of all this than *a veritable Panamá.*

But it occurs to us that there will not be lacking, perhaps, some one among the readers of these lines, to whom it may seem strange, that none of those great expeditions that from time to time have been sent to Tehuantepec and Central America by divers countries, for the exclusive purpose of seeking there a suitable place for the opening of an interoceanic canal; expeditions which have devoted all the knowledge of science and rendered special estudies on the soil itself, have not been able to attain the brilliant success that has crowned the efforts of two men alone, and who did not possess the great elements which the former brought to the country; but there is nothing easier to be explained than this.

We will say, first of all, that the studies made by Messrs. Carrillo de Albornoz and del Río were also special, and embraced a much larger field than that to which the divers scientific expeditions mentioned devoted theirs in Mexico. These, imitating to some extent what the ants do, followed one behind another, with insignificant deviations, the same path as that taken by their predecessors; while Messrs. Carrillo de Albornoz and del Río, after studying in turn and estimating at their true value the obstacles which had resisted the efforts of the former, abandoned the difficult zone so many times and so uselessly traversed, and devoted their labors to fields as yet unstudied. Our fortunate explorers also here encountered a thousand obstacles that Nature has placed there, as if to bar the puny efforts of Man; but without ever losing heart, they continued their investigations until the great secret was discovered, the key, as it were, that will open the door, through which will pass all peoples of the earth, to enjoy the advantages for which they have longed during the last three hundred years.

It appears that the causes which influenced most the scientific expeditions to which we have referred, and whose studies did not attain the desired end, were those to profit by the narrowest part of the isthmus as well as by the ports of Coatzacoalcos and Salina Cruz, without thinking that a little further to the east they might encounter other ports equal or even superior to these, owing to their physical conditions, where in a short time would be built towns far more important than the two cited; and without thinking either, that although the isthmus might increase towards the east in width, the ground might offer less obstacles for the construction of the canal than in its narrowest part.

On the other hand, it seems very natural that all the studies which have been made for the purpose of finding adequate means to overcome that natural difficulty in the way of international commerce, should have been devoted in preference to the narrowest parts of the Continent; but fortunately for Mexico, Messrs. Carrillo de Albornoz and del Río had a happy inspiration in abandoning that routine idea.

All those disappointments and hardships that have been suffered, and to which we have referred in so rapid a manner, have not affected in the least, however, the idea of establishing the needed maritime communication across some one of the isthmuses mentioned; for precisely at the moment that we trace these lines, greater studies, perhaps, are being carried on for the realization of this grandiose plan. And that this may be the case, despite the failures to which reference has been made, will cause no surprice whatever, if we stop to think even for a momet upon the urgent necessity for that communication, created by the constant and rapid development of commercial traffic between the divers countries of the world, and the enormous advantages that for that commerce and for the general interests of those same countries will result from the establishment of the maritime communication across any of the isthmuses mentioned, *but more particularly so through the Mexican Isthmus.*

We say this, not only on account of the great distance that would be saved betewen the principal ports of the world, by opening the canal through our isthmus, as may be seen in the comparative table appearing on another page, and the greater saving made in both time and expenses of navigation, but also for the greater facility and the less cost required in its construction.

Among the countries most interested at present in the opening of the interoceanic canal, there figures as first among them the United States. This, whose growth and power have no precedent whatever in modern history of the development and the wealth of nations, having comprehended the great significance that this maritime communication may have for its interests in general, resolved lately to establish it via Nicaragua; and as England has some interests there, it began diplomatic negociations with her, arriving at an understanding a few days ago by means of the Hay–Pauncefote Treaty.

While these negotiations were under way, the government of the United States had others also pending with Nicaragua and Costa Rica, for the purchase of a strip of territory through which should pass the interoceanic canal. At the same time the French company of the Panamá Canal was trying to sell its concession to the government of the United States for.... $109.141,000; and the Commission appointed to study and decide which of the two routes, that of Nicaragua or that of Panamá, would be the most convenient for the opening of the

Canal, was preparing its report recommending the Nicaragua Route.

This report was sent to Congress on the 4th of December, 1901, and the project was adopted in the House of Representatives by 208 votes against 2, on the 10th day of January, 1902, authorizing at the same time for that work, the expenditure of $ 180.000.000, American gold.

Although some opined at once that the project would not pass the Senate, what had happened induced most people to believe that all hope for the Panamá Canal Company was lost; but the latter upon seeing its interests thus menaced by so powerful as rival, without entertaining great hopes of being able to finish the work commenced, and obliged moreover, by reason of its interior dissensions, proposed to sell to the United States the concession, together with all the properties, its works commenced, the plans prepared, its machinery, etc., etc., for.... $40.000,000, a sum at which had been appraised alone the works executed already, by the Commission appointed by the Government of the United States to verify, as has been said, which of the routes was the most suitable, whether that of Nicaragua or that of Panamá.

The unexpected and really tempting proposition made by the French Company, sowed genuine alarm among the partizans of the Nicaragua Route, for general opinion inclined at once toward the opening of the Panamá Canal: as in addition to offering less technical difficulties, the cost of construction of the latter would also be, thanks to the proposition of the French Company, inferior to that of the former, calculatings this difference at five million dollars gold. Even the President of the United States declared himself resolutely in favor of the Panamá Route.

But it appears that this important affair is destined to cause as many surprises as disappointments.

During these latter days, many and terrible have been the alarms suffered, not only by the partizans of the Nicaragua Route, but by those of the Panamá as well, for both have at stake in this matter great interests to gain or lose.

The vote in the House of Representatives in the United States, to which we have already referred, made it appear a complete triumph for the partizans of the Nicaragua Canal, and rendered desperate all those who were working in favor of the Canal through Panamá; but soon after the French Company, with its unexpected proposal of the $40.000,000, caused a change in attitude, and then it was the turn of the partizans of Panamá to rejoice and those of Nicaragua to despair. And when it was believed that the latter had been routed, we find that a special Commission named by the Government of the United States, for the purpose of studying the matter, has just made important discoveries, contrary to the purchase of the Panamá Canal. Joy has returned then to the hearts of the partizans of the Nicaragua Route.

But can it be assured that there is not reserved for them some new disappointment?

We are of the opinion that if the United States does not succeed in opening its canal in Panamá, they will open it in Nicaragua; but at all events, this will in no way injure our project for the opening of another canal in the Isthmus of Tehuantepec, for the INTEROCEANIC CANAL OF MEXICO will ever be the one to shorten most, and in a notable manner the distance lying between the principal ports of the world.

In addition, as we have already said, our projected canal can be constructed without a single lock, a most essential condition to render its exploitation cheap and easy; while according to the latest studies carried out for the opening of the canals of Nicaragua and Panamá, the first exacts for its exploitation the construction of eight large locks, and the second four, for it has been seen that the latter cannot be oponed on a level, as at first believed.

Treating this so much debated question, and which in place of losing appears to increase in interest constantly, the distinguished Mexican statistician, Matías Romero, said in 1888, to a journalist of Washington, who went to see him regarding the merits of the Tehuantepec Route compared with those of Nicaragua and Panamá, the following:

"I have taken no great interest in the rivalries arising over the American isthmuses, because I believe that this question will be decided by its natural aspects, geographical and commercial. The principal American isthmuses are three in number, through which maritime communication has been projected: Tehuantepec, Nicaragua and Panamá. If the increasing necessities of the commerce of the world, or its extraordinary future development should require the opening of those three routes, and if they are found practicable, all will be constructed, whatsoever may be the obstacles presented. The opening of a canal necessarily benefits the neighboring countries, and under this aspect, whatever may be the result of this question, all the American nations will be benefitted by the opening of any of the indicated routes. We believe that Tehuantepec offers as many advantages as any other isthmus, and for this reason we await the result without any impatience."

Later, in 1894, referring to the National Railway of Tehuantepec, he wrote thus:

"The advantages offered by the interoceanic route through Tehuantepec are great in comparison with the Panamá Route, not only from a geographical but from a commercial point of view as well. A map containing the two routes would demonstrate in a general manner the geographical advantages pertaining to that of Tehuantepec, for the commerce between the coasts of the United States and even for western Europe. Admiral Schufeldt, of the Navy of the United States, expressed with vigor the commercial advantages of Tehuantepec, in the official report rendered by him in 1871, in which he said:

"Each isthmus increases in importance in proportion to its proximity to the commercial centers of the United States."

All other conditions being equal, the route presenting the greatest advantages will be the one lying nearest what may be considered as the commercial line of the world, that may be marked upon the globe between Hong-Kong and Yokohama on the Asiatic coast, across the Pacific Ocean, passing through San Francisco, through the United States of New York, and across the Atlantic to Liverpool or Havre. Of all the interoceanic routes, that of Tehuantepec is the one found nearest this line. In a direct line the distance between Tehuantepec and Panamá is 1,200 miles or nearly one half of the distance lying between New York and New Orleans.

In examining a sphere, it is found that the shortest cur for sailing vessels or steamers between Eastern Asia and any part of the Pacific coast on the American isthmuses passes at close proximity to the coast of Tehuantepec; in fact, the shortest minimum circle from Panamá to Hong-Kong, would pass through Tehuantepec to the east of San Francisco, and almost to the Aleutian Islands. Even the shortest way from Panamá to the Hawaiian Islands would pass close to Tehuantepec. It will be comprehended at once therefore, that it would require almost double the distance mentioned to cross the Isthmus of Panamá, especially for the traific of the Pacific Ocean with the Gulf ports. On a lesser scale, the distance via Panama to all the ports of the United States and western Europe on the Atlantic would result considerably diminished through Tehuantepec.

If a comparison be made between sixteen of the principal routes of commerce between the East and the West, there would result a total saving of more than 125,000 miles by way of Tehuantepec.

It will be seen, moreover, that the question of comparative distances also affects in a very important degree the entire interior of the United States, especially the Mississpipi Valley. There is hardly a matter of 810 miles from the mouth of the Mississippi river to the eastern extremity of the Tehuantepec Railway.

The total distance per railwaiy and water from Chicago to the Pacific coast by the Tehuantepec route is only 1,875 miles.

The nautical conditions for sailing vessels are much more faforable in Tehuantepec than in Panamá. Navigators always avoid, when possible, the region of calms on both sides of the Isthmus of Panamá. These calms extend a considerable distance into the Pacific Ocean at the latitude of Panamá. I rest this opinion upon data obtained from Lieutenant Maury and Captain Bent, recognized nautical experts.

This advantage may be considered by some as of little importance, for the reason that it is believed that sailing vesels are being substituted rapidly by steamres; but as regards the United States, good nautical conditions are and will be for a long time to come of great advantage, because the tonnage of their sailing vesels exceeds that of steamers. From the foregoing it appears, that once the interoceanic route throgh Tehuantepec is established, the eastern and the wertern coast of the United States and Mexico will be united through the best possible point, and will develop a coast trafic of great magnitude and of vast importance for the two countries.

The climatic conditions are very favorable in Tehuantepec. The reigning winds from the northeast of the United States that cross the Gulf of Mexico render the climate of Tehuantepec healthful. I was born and for many years lived in the City of Oaxaca, capital of the State to which Tehuantepec belongs.

I have been in Tehuantepec also, without having lived there, and can state from personal knowledge that it has a healthful climate, taking its latitude into account."

Also "El Mundo," which is one of the principal and most reliable newspapers published in the City of Mexico, does due justice to the Isthmus of Tehuantepec, or Mexican Isthmus, in the followin lines, which we find in one of its numbers of January last:

"During the last discussion had in the Senate at Washington, with regard to the question as to which of the isthmuses, that of Nicaragua or the Panamá, should be selected for the bouilding of the intereoceanic canal, Mr. Shackelford, representative from Missouri, after having compared the various opinions, expressed his belief that it would have been preferable to choose the Tehuantepec Route. If there be taken into account the solid judgment characteristic of American business men, then the opinion uttered by Mr. Shackelford cannot but carry a great weight, and it cannot fail to be one more proof of the many great advantages which the Isthmus of Tehuantepec possesses for the stated purpose over the other two which have been considered in the interest of the commerce of the world.

And, in fact, the Isthmus of Tehuantepec is, owing to its geographical situation, the most suitable point for the future congregation of great human assemblies. The Gulf of Mexico at no very distant period, will be for the New World what the Meditterranean has been for the Old, the crossing point of all the itineraries of civilization and center of all mercantile transactions. It is no matter of conjecture to any one to–day, that the Antillian archipelago, that multitude of geological fragments cast at our door, once united by the wires of the North American federation, must be the site whereon will be sought the goal of the future Argonauts. In addition to the opulence of those islands, some of which rival the perfumed Ceylon, they form the frontispiece of the South American world; and the Caribbean Sea, that bathes all these tropical shores, the vehicle of communication between all the peoples of earth. The Isthmus of Tehuantepec is the bridge o'er which shall pass this human caravan.

As on the planet are found zones in which exists heat equally intense throughout, so also there are what may be called mercantile lines, through which passes the wealth of commerce and industry. The principal of these lines starts from the eastern coast of Asia, follows through Japan and the Phillipines, continues its course accross the Pacific Ocean, remaining broken and suspended before the American Continent, without being able to extend itself to the Atlantic. There is no more suitable way for this transubstantiation of civilizations than the Isthmus of Tehuantepec, lying precisely within that line of navigation."

The opinion which Mr. Shackelford expressed in the American Senate is perfectly in accord with our own; but as we do not desire to sell our project to any foreign government, nor would Mexico permit such a thing to take place, but to carry it into effect with the aid of private capital, it is entirely indifferent to us what the United States or any other country may decide to do with respect to the said interoceanic communication through the isthmuses of Nicaragua and Panamá. We are fully convinced to-day that the Mexican Isthmus offers, from all points of view, advantages very superior to those offered by the other two isthmuses cited, for the maritime communication between the Atlantic and Pacific oceans; and, consequently, we do not entertain the slightest spirit of opposition toward any other enterprise.

We believe, also, that when once those advantages to which we have made reference in the present chapter are known, for the construction of an interoceanic canal ocross the Mexican

Isthmus, we will encounter no serious difficulties in raising, in the United States or in Europe, the capital necessary for the construction of that grandiose work. We would feel this same firm conviction, even were the projected Nicaragua and Panamá canals already constructed and in full exploitation; so enormous are the advantages that must forever be enjoyed over them, from the day on which it will be terminated, by our Interoceanic Canal of Mexico!

City of Mexico, March, 1902.

S. Adalberto de Cardona.

OUTLINES FOR ITS CONSTRUCTION

We have already stated that since the epoch of the Conquest, the importance of the Isthmus of Tehuantepec was taken into account for the establishment of interoceanic communication; but it was not until the latter part of the eighteenth century that anything favorable was effected in this direction, by the openig of a road in 1798, from Tehuantepec to Salina Cruz. To relate even lightly the reconnoissances made in the isthmus since then, with the view of constructing some interoceanic railway or canal, would occupy more space tan we can give to it here, nor is such recital necessary to attain the ends sought in this brief work; suffice it to say, that after more than a century, it has been possible to construct the railway only, and that not long ago. We have the explanation of all this in the following lines, taken from the report of Messrs. Carrillo de Albornoz and del Río:

"In general, the most notable scientists and geographers of the world have had the caprice to open interoceanic canals, precisely at the narrowest part of te isthmuses, which are without doubt the places most worn away by the waters, which have formed there a veritable network of rivers, gulches and precipices, some of these truly frightful, owing to their depth, thus rendering impossible the opening of a canal, and if not impossible, at least most difficult the construction of a railway, which is much simpler. The construction of a railway on those broken lands cannot be effected without very pronounced grades without works of great cost and the formation of numerous curves and turns, all of which add to the length of the lines and render its exploitation very dear."

Had it not been then for this useless and costly persistence, the so long desired maritime comunication would have been established many years ago, without any doubt. But better late than never. The discovery has been made, and before long the barrier that impedes the union of the waters of the Atlantic and the Pacific, and which has retarded the expansion of universal commerce, will be destroyed.

And how simple seems the study that has brought about such valuable results, so simple that a child of tender years might comprehend it!

According to the said report, it was in the year 1856 that Messrs. Carrillo de Albornoz and del Río made their first trip across the fertile and virgin regions of the itshmus in search of coal, iron and petroleum, finding immense deposits of all these. This induced them to think upon the necessity of establishing easy means of transportation to thus give greater value to that wealth which they had succeeded in discovering, and they studied this question then with closest care, examining in every part the course of the rivers that discharge into the Gulf of Mexico and into the Pacific Ocean. Those explorations furnished them an extensive knowledge of the topography and the prodigious natural wealth of that part, almost depopulated as yet, of our country; but for various reasons not necessary to explain here, this was the only beneficial result obtained on that occasion.

Some years later, their strong and tenacious character led them many times to think upon the subject and to undertake new studies; but has upon each occasion, they modified their plan ou a grander scale, they arrived at last to forget their original project and delivered themselves over fully to the search of a means that would facilitate them in opening an interoceanic canal on Mexican territory.

The project of constructing a canal across the narrowes part of the Isthmus of Tehuantepec had been frustrated; and it could not have been otherwise, for it would have been necessary to confront there a mountain 180 kilometers in diameter, the base of which deflects the revers of both coasts, resulting that their waters could not be utilized to supply the highest part of the canal, which would mean a dry, absurd and impossible canal; the creeks that descend from the heights of the mountain would never have sufficed to feed a canal of such proportions.

They concluded, therefore, to not lose any time in that zone, where the repeated efforts of others had failed; but to follow their explorations with the hope that soon or late they would encounter, in some other part of the same isthmus lands suited for the construction of that canal, which already occupied their thoughts as much as any of those necessities that imperatively form a part of life. To such a degree had that beautiful project become identified with their very existence!

At last, after so many explorations, so many reconnoissances of rivers, gulches, plains and mountains, they had the inspiration to seize upon the great Grijalva River, as a canal constructed already by Nature in its three fourths parts, without having to do anything more than to deepen its channal, to prevent its overflows, and the forming of those numerous branches or rivers that now discharge their waters into the sea, without any benefit whatever to anybody.

And, in fact, while the Coatzacoalcos river, whose waters were sought to be utilized by those who conceived the idea of constructing an interoceanic canal across the narrowest part of the isthmus, is navigable for a space of only a few kilometers, its importance terminating at the foot of the Tehuantepec mountain; the Grijalva River, on the contrary, flows majestically and with a descent of 282 milimiters per kilometer through the States of Chiapas and Tabasco, where it is navigable without the necessity of employing great steam pressure, from its mouth to the point called Mal Paso, a distance of 230 kilometers.

Utilizing then this river up to said point, an excavation 95 kilometers in extent which offers no very serious difficulties, can be made with a descent of 684 milimiters per kilometer, as far as the Bar of Tonalá, on the Pacific. The canal can be fed with the quantity of water desired, as there is an abundance of it, and in order that whirlpools may not be formed that might obstruct navigation, means have been discovered also by which the waters shall flow softly and tranquilly.

In place then, of the 128 lokcs calculated by the European Geographical Congress for its *dry canal* in Tehuantepec, the project of Messrs. Carrillo de Albornoz and del Río may be carried into effect, without the construction of a single lock, a matter of marvel to the authors of the project themselves, even being absolutely sure of what they have attained, as they themselves ingenuously confess.

The pass to which we have just referred is not the only one possible for the construction of the Interoceanic Canal of Mexico; for when once the simple plan shetched occurred to Messrs. Carrillo de Albornoz and del Río thanks to the vast knowledge they had acquired during their former explorations of that rich region of Mexico, they were facilitated in terminating satisfactorily other studies, utilizing various of the principal currents that fecundize the States of Tabasco, Chiapas and Oaxaca.

The following are the divers ways through which may be constructed no the projected canal, commencing with the one already indicated, which is the one lying farther to the east and of greatest extent:

From the Tonalá Bar, on the Pacific, to the Tabasco Bar, on the Gulf, via the Mezcalapa and the Grijalva rivers, and an excavation of 95 kilometers	325
From the Tonalá Bar, on the Pacific, to the Chiltepec Bar, on the Gulf, via the Mezcalapa and González rivers	300
From the Tonalá Bar, on the Pacific, to the Dos Bocas Bar, on the Gulf, via the Mezcalapa and the Seco rivers	275
From the Tonalá Bar, on the Pacific, to the Santa Ana Bar, on the Gulf, via the Santa Ana, Mezcalapa and Venta rivers	217
From the Tonalá Bar, on the Pacific, to the Tonalá Bar, on the Gulf, via the Tancochapa, Mezcalapa and the Venta rivers	250
From the Santa Ana Bar, on the Gulf, and the San Francisco Bar, on the Pacific, via the Santa Ana, Mezcalapa and Ostuta rivers, the Santa Ana Lagoon, on the Gulf and the Inferior Lagoon, on the Pacific	225

(An English mile contains one kilometer and 333 meters. A meter contains 39¼ English inches.)

Each one of the routes offer special advantages that the others do not possess; and, therefore, the importance of some of them may be compared with the others in the final study to be made upon them, for the purpose of adopting the one best suited for the construction of the canal. The one preferred at present by the engineers Messrs. Carrillo de Albornoz and del Río is that which commences at the Santa Ana Bar, on the Gulf of Mexico, and terminates at the San Francisco Bar, on the Pacific.

As will have been noted, it has been impossible to trace any of the divers ways or routes indicated without the aid of the Mezcalapa River. Without the volume of its waters, this project would be a failure as much as in the case of the Tehuantepec Canal. Some data, then, making known its importance perhap will not be out of place here.

The Mezcalapa River in the year 1700, after passing through Huimanguillo, flowed directly into the Gulf of Mexico, through the channel to–day known as Río Seco. At the begining of the eighteenth century, natural phenomena aided by artificial works, changed its northeastern course, and running then toward the east, in flowed into the Grijalva, which had then a lesser volume of water than the Mezcalapa. For this reason, perhaps, the latter began to be considered as the prolongation of the Grijalva; and the Sierra River, which was its veritable prolongation, was considered from that time on as an affluent of the Grijalva, from the point of its union with the Mezcalapa.

The Mezcalapa has its source in the Cuchumatanes range, where it is known with the name of Lagartero River, near the frontier of Guatemala, in the Department of Comitan, State of Chiapas, and a little further on takes the name fo Chiapa River. It passes through the city of Chiapa, from which point it is navigable, and follows its course with the same name to the town of Quechola. Lower down, on the Hacienda de las Palmas, a place where it measures 125 meters in width and 35 meters in depth, it receives the name of Mezcalapa, down to the point where it unites, 4 kilometers before passing through the city of San Juan Bautista, with the Sierra River, which, as we have already said, formerly constituted the prolongation of the Grijalva.

The principal affluents of the Mezcalapa are 42 in number.

The river is well channeled, up to 5 kilometers above Huimanguillo, where it has a width of 180 meters and a depth of

52 meters. Its shores have a height of 10 meters, approximately. Above Huimanguillo, is where its main branches, known by the name of Seco, González and Nuevo rivers are formed, as well as many others of lesser importance, due perhaps to the fact that from that place on the banks of the river are very low. These currents frequenty chanfie their channels, and the cause of these deviations are due to the fact that in the rainy season the affluents carry down great trees and trunks which amass at some parts, and the waters seeking then a new channel inundate the plains of Tabasco. The said principal currents, formed by the overflows of de Mezcalapa, discharge into the Gulf of Mexico, through the bars of Chiltepec and Dos Bocas, all being navigable throughout a greater or less extent, which proves that the volume of water of the river is more than sufficiedt to feed the canal project by Messrs. Carrillo de Albornoz and del Río.

The length of the Mezcalapa from its source to its union with the Grijalva is 780 kilometers; and its navigable portion, from Mal Paso to the Bar of Tabasco, is 230 kilometers. In the State of Chiapas, this river hast other navigable portions, and some of its affluents in the southern portion of the same State are also partially navigable, like the Venta and the Santo Domingo rivers.

ROUTES ON THE GULF-SIDE.

As will be seen on the corresponding map, there are five routes that have been studied on the gulf side for the construction of the canal.

The Grijalva was the first to occupy the attention of the initiators of the project. This river, which is a continuation of the Mezcalapa and discharges into the Gulf of Mexico through the Bar of Tabasco or port of Frontera, has 230 kilometers in extent, from the point called Mal Paso, and is navigable throughout.

The González River was the next to be studied for the same purpose. This, which constitutes the principal branch of the Mezcalapa, and whose volume of water is greater than that of the Grijalva, which is to-day considered as the principal channel, begins on the left shore of the said river, at the place called Boca del Plátano, and flows through alluvium soil, which accounts for its not having any fixed channel. The river forms one of the most important fluvial ways of Tabasco, not only for its depth and great volume of water, but also for the fact that it discharges into the Chiltepec Bar, which is the best along the coast of Tabasco. It passes at only 6 kilometers distance from San Juan Bautista, capital of the State of Tabasco, and its navigable distance from Mal Paso to its mouth is 205 kilometers.

The Seco River was object of the third study. As already said, this river formed the old channel of the Mezcalapa before this deviated its course into the Grijalva; it carries little water at present and discharges into the Gulf of Mexico through the Dos Bocas Bar. It is navegable only during the rainy season, for a short distance from its mouth.

A red line starting from the Santa Ana Bar, and which forming a slight curve crosses the lagoon of this name, follows along the channel of the Santa Ana River, and reaches the left shore of the Mezcalapa in the town of Huimanguillo, designates on the map the fourth study carried out by Messrs. Carrillo de Albornoz and del Río. The distance between the Santa Ana Bar and Mal Paso is 130 kilometers. From Huimanguillo to the Santa Ana lagoon it is 42 kilometers, and this would be the distance necessary to be excavated in order to construct the canal through this place, utilizing the Santa Ana River that discharges into the lagoon. The basin of this river commences at 10 kilometers from Huimanguillo, and the works would be of comparatively little cost; the excavations, thanks to the configuration of the soil would be 15 meters at their greatest depth.

The fifth and last of the studies made on the side of the Gulf of Mexico, commences at the Tonalá Bar, at the mouth of the Tancochapa River. The distance lying between this point and Mal Paso is 155 kilometers. By constructing the canal through this place, the Mezcalapa might be desviated from Huimanguillo to the point where the Tancochapa has its source, and from there on the channel of the same river can be utilized. The distance lying between Huimanguillo and the Tonalá Bar, on the Gulf, is 75 kilometers, of which *46 kilometers are navigable* from Hacienda San José del Carmen to the Gulf. The depth of the Tancochapa at the said hacienda is six meters.

By the configuration of the land in the distance lying between Huimanguillo and Tonalá, it appears that the Mezcalapa flowed through this basin to the Gulf; in the same manner as it deviated from the Seco River, as its former channel is to–day called, to unite with the Grijalva, so it may have deviated prior thereto in order to effect a passage to the Gulf through what is to–day known as the Tancochapa River.

All these reasons demostrate clearly that the soil of Tabasco is moveable, and this is confirmed, not only by the study that has been made of the divers rivers that we have touched upon, but also by the constant deviation noted in the channels of almost all the rivers of the State. These circunstances favoour project very greatly, because the works to be undertaken there will entail a cost very inferior to that incurred if they were carried on through hard or rocky soil.

Constructing the canal between the ports of Tonalá on the Pacific and Tonalá on the Gulf of Mexico, quite a straight line would be formed, and much shorter than that of the projected Tehuantepec Canal, which could not be realized; with the difference in favor of ours that no locks would be needed and that it would be supplied with the necessary water, for in addition to the Mezcalapa River, which would suffice to feed it, the waters of the Tancochapa would also contribute to the same purpose.

At first sight it would appear that the rational and least costly course would be to utilize the Grijalva River throughout its whole length for the interoceanic canal; but upon entering into details, contrary results are reached, as will be seen from the following. The Grijalva River is 4 meters deep, and as our projected canal must needs be 10 meters, it would be necessary to deepen this river six meters through the distance lying between Huimanguillo and Frontera, which is 125 kilometers. Taking this into account, the excavation required to make the canal navigable for large vessels, would make a total of..... 44.000,000 cubic meters.

The cost of the excavation would be much greater than that caused by the deviation of the Mezcalapa River from Huimanguillo to Tonalá, a distance of 75 kilometers as before stated, utilizing the channel of the Tancochapa. This river being navigable for a distance of 46 kilometers, an excavation of 29 kilometers only would be required. Due to the nature of the soil, this excavation would scarcely reach 15 meters at its greatest height, and the slope of the canal would be 65 centimeters per kilometer, which is a very insignificant grade.

By constructing the canal through the Santa Ana Lagoon, which as already said is distant 42 kilometers from Huimanguillo, the excavation necessary would be only 37.800,000 cubic meters.

The Santa Ana Lagoon has an extent of 900 square kilometers. Its depth varies from 19 to 25 meters; the width of its mouth is 3,500 meters, and the depth at the bar is 35 meters. The distance separating the lagoon from the sea is 4 kilometers. It is a handsome bay, very superior in extent and depth to that of Havana.

The distances that vessels would save in coming foom any part of Europe and the United States by not passing through the Tabasco Bar are as follows:

From Tabasco Bar to the Chiltepec Bar.....	25	kilometers
,, ,, ,, ,, Dos Bocas............	37	,,
,, ,, ,, ,, Santa Ana Bar........	112	,,
,, ,, ,, ,, Tonalá...............	165	,,

The distance from the Santa Ana to the Coatzacoalcos Bar, terminal point of the Tehuantepec Railway on the Gulf of Mexico, is 48 kilometers.

OUTLINES ON THE PACIFIC SIDE.

The sketch and profile of the line from Mal Paso to the Tonalá Bar on the Pacific, give a sufficiently clear idea of the configuration of the soil and permit one to appreciate the most important distances.

The slopes of the mountains on the Pacific side are very rapid, and in order to descend from the Ocosocoutla Plateau to Tonalá, it is necessary to cross the San Fernando Range, which is neither high nor very extensive; the descent can be made easily through La Calera cut. This is the portion of the land offering difficulties.

In adition to that of La Calera, there are three other passes through which it is possible to descend to the Pacific. One of these is that of La Mica, to the east of La Calera, which would lead the canal to the handsome San Marcos Bay, 20 kilometers to the east of Tonalá, Another of the passes mentioned might be effected through the basin of the Venta River, at Jiquipilas; cutting the canal through here, it would discharge its waters 45 kilometers to the west of the Bar of Tonalá. The last pass studied leads to the San Francisco Bar, as will be seen farther on.

Of these four passes, through which descent can be made to the Pacific, two have received special studies on the part of the initiators of the project: those leading to the Tonalá and San Francisco bars.

The outline from Mal Paso to Tonalá, on the Pacific, is the straightest, but the excavations exacted are of considerable height, although for a short distance. Deviatig the line to the east, at kilometer 35, as seen on the map, in order to pass through La Mica cut to San Marcos Bay, those excavations would be reduced almost one half, and the descent would be less rapid there than through the straight line to Tonalá; but this route has the objection of presenting several curves and of being longer than the one projected to Tonalá.

For the construction of the canal along the line leading to Tonalá, on the Pacific, there would have to be executed at Mal Paso, the dividing point of the waters in such case, some levelling works for a distance of one kilometer, in order to avoid the whirlpools that would naturally be produced there impeding easy navigation; and the bottom of the canal would have to be constructed also in such a manner that two thirds of the waters would pass to the Tonalá side and the other third to the Mezcalapa River.

The line leading to the San Francisco Bar commences at a point situated 35 kilometers to the north of Mal Paso, on the left bank of the River Mezcalapa; it follows from there in a southwesterly direction along the basin of the Ostuta River, and crossing the Inferior Lagoon terminates at the said bar.

From the indicated point in the Mezcalapa to the San Francisco Bar, there is a distance of 138 kilometers.

The Ostuta River has its source on the plain lying between the San Fernando Range and the base of the Atravesado Mountain; it runs thence southward a distance of 65 kilometers, and crossing the Distric of Tehuantepec, in the State of Oaxaca, discharges into the Inferior Lagoon. The width of the river at its outlet is 55 meters, and its depth 10 meters. Its principal affluents are the Fortuna, Zuluapa, and Guamol rivers.

Due to the studies taht have been made, Messrs. Carrillo de Albornoz and del Río are of the opinion, that the Ostuta River is formed by subterranean discharges from the Mezcalapa River; and that by mahing an excavation between this and the Ostuta, with the required levelling, in order to reach the channel of the second, the result would be that throughout the entire extent of the canal there would not be a single lock.

Beyond the ranch called Piedra Grande, last inhabited place along the line of the Ostuta River, in the direction of its source, the valley commences to narrow, the vegetation gradually becomes scarcer and disappears at last completely; upon the sides of the river arise enormous black rocks and also, farther on walling its channel, granite cliffs which attain to an elevation of even 150 meters, for which reason it is very difficult and at times impossible to travel along its shores. All presents there an aspect of sadness, except that gigantic canyon or cut, carved by Nature to facilitate maritime communication across the Mexican Isthmus among all the peoples of earth..

Later on one descends into a new valley, and the change that here takes place is then surprising; in place of the desolate aspect of that roeky portion, there appear low wills and beautiful plains covered with luxuriant vegetation. between which peacefully glide the currents of the Ostuta. Upon those lands some rough places are also found, but not exageratedly so; there is a labyrinth of low hills, separated in general one from tye other, in some cases forming groups and ranges of no great thickness in others; but all indicate the facility with which the Work of the canal might be carried out through here. This place is a veritable desert, inhabited to-day only by *dantas* or tapirs, numerous birds and fine fish; but a desert rich in attractions, and in which tomorrow there will be confounded the song of those birds With the cheerful whistle of the steam vessels, in their passage across the two principal seas of both worlds.

By examining the profile in the corresponding map, it will be noted that the difficulties in crossing the Sierra present themselves at 60 kilometers from the Pacific coast, and that they are confined to a distance of some 40 kilometers; but in this last portion is where one encounters the great natural cut already mentioned, along side the Atravesado Mountain The difficulties offered by that pass at first sight. were parhaps those which induced the divers commissions of engineers to which we have referred elsewhere, not to make any study upon those lands, and which without any benefit whatever partially traversed the Isthmus of Tehuantepec; in search of a means, to establishs the desired communication of the two oceans.

Following this last route, the canal would have to cross the Inferior Lagoon, a distance of 23 kilometers, to the San Francisco Bar, and its total length from this bar to that of Santa Ana, to the Guft of Mexico, would be 275 kilometers.

The total excavations that would have to be made for the construction of the canal along this line, would be 465.000,000 cubic meters aproximately.

The width of the canal in its whole length will be 60 meters on the surface and 50 meters at the bottom; its depth will be 10 meters.

The distance lying between the Tonalá Bar, on the Pacific, and that of San Francisco is 110 kilometers.

It appears that the last line of which we have spoken, would be the least costly and the most convenient for the establishment of the desired maritime communication betwen the Atlantic and the Pacific. The Santa Ana and the Inferior lagoons, its terminal points on both seas, are two excellent bays of great etxent, where vessels of deepest draft can find safe shelter. In addition, by following this line the range of mountains is passed at its least height, and the volume of water feeding the canal would be increased by the currents of the Ostuta River.

ADDITIONAL INFORMATION

In January, 1885, "The Mexican Financier," published in the City of Mexico, speaking of the Tehuantepec Canal, said the following:

"When all other circumstances are equal, commerce will adopt the shortest line by steam or sail. At the present time promptness is sougth in the delibery of all hinds of merchandise; and by a single glance, it may be seen that there is a considerable economy of time offered by the Tehuantepec Route. The cereals of the Pacific coats, which en route toward Europe to-day have to round Cape Oorn, spending almost five months on the trip, by means of the canal, the distance would be shortened almost 8,000 miles and the time would be reduced to two months and one half, a little more or less. Commerce in graint is already considerable and rapidly increasing, even against the enormous disadvantages that exist to-day. Reduce the distance and time one half and the products of the Pacific coast might compete very advantageously with those of India, Australia and other exporting countries. The inevitable result of this will be that on the Pacific coast the raising of wheat will be increased, exportations will be duplicated, the farmer will obstain better prices for his products and California, Oregon and the Territory of Washington, no longer isolated from the rest of the world, will enjoy prosperity and experience the growth to which they are given right in the fertility of their soil and the deliciousness of their climate. The intrepid emigrant from Europe, whom existing circunstances keep away from those rich lands by reason of the great expense incurred in going there over the transcontinental railway lines will search via Tehuantepec the shores of the Pacific. Then all the coasts of the Atlantic and the Pacific, belonging to the United States and to Mexico may rival in commerce with Australia, China and Japan, that to-day pass toward the west, as far as Europe and New York, over the Suez Canal or around the Cape of Good Hope in steamers or sailing vessels. When it is recalled that the commerce of Australia has increased during the last five years from $225.000,000 to $500.000,000, and that the United States scarcely represents four per cent. of that sum, the advantages of a direct route by water will be at once comprehended. The present advantageous situation of all the towns along the Gulf of Mexico, hidden as may be said, upon the most distant shores of an interior sea, with exit in one direction only, merits special attention. The traffic to which England owes more than to anything else her grandeur and mercantile orosperity, is the commerce of the East. Her traffic alone with the nations of the Pacific reaches almost two billon dollars per annum. It suffices to reflect that agriculture; mining and the factories of the Mississippi Valley and of the territory tributary to the Gulf of Mexico, produce each year four billions of dollars, to render it imposible for the imagination to embrace all the benefic results of establishing a traffic wiht Asia, Australia and Polinesia, in order to send there the excess production of so extensive a valley."

We think it well to also call attention to the following assertions of Lieut. Maury and Captain Silas Bent, although we have already referred to some of these assertions in another place:

"The simple enunciation of the difference in miles is a very inadequate means of calculating the time employed by sailing vessels on their divers voyages: and when it is considered that three fourths parts of the commerce of the world across the ocean is made in sailing vesels, we can easily see what an important factor is the question of "sailing time" in order to solve the problem that we have now before us.

The winds from the north that cross the Atlantic are so inconstant and interrupted, that when they reach the Antilles they never penetrate the Caribbean Sea; but they extend, notwithstanding, as far as the Gulf of Mexico, and often even reach Tehuantepec; so it happens that while on the Gulf there are always winds, the Caribbean Sea remains in a state of almost uninterrupted calm.

Nor is this all, because the chains of mountains that extend along the Isthmus of Panamá and across Central America, present a barrier yet more formidable to the passage of those winds, launching them thus into a higher region of the atmosphere, and extendings the calms more toward tye interior of the Pacific in the parallel of Panamá, for as pace of 1,500 to 1,800 miles to the northwest along the coast of Central America. This whole region of calms in the Caribbean Sea as well es on the Pacific Ocean is so well known to navigators, that sailing vessels avoid it whenever they can, although in order to do so they may have to sail a thousand miles out of their way.

The lack of wind leaves, of course, that vast area exposed to the unmitigated head of a torrid sun, excep when it is relieved momentaneously by the devastating bursts of wind of the dry season and the abundant rains of the wet season. Taking into account such meteorological facts, let us suppose that the Panamá Canal and the Eads Railway for vessels at Tehuantepec are both concluded and in operation; let us stat two sailing vessels of equal tonnage and of like speed from the mouth of the Missisippi, with a cargo for China, one passing through the Panamá Canal and the other through Tehuantepec, and I dare to affirm, that when the one via Panamá has left the canal and is navigating in the waters of the Pacific, the one sailing via Tehuantepec will have crossed the isthmus and would find itself in the meridian of the Sandwich Islands; and that before the firts can plow the 1,500 miles of ocean in calm which extend before it, the last will have travelled 5,000 miles across the Pacific and will be 30 days ahead of its adversary. Because it is a fact worthy of mention here, that the force of northeastern winds of the Pacific as well as the maximum force of the greater equatorial current of said ocean are found near the latitude of the Isthmus of Tehuantepec, the first blowin with an impellent force toward the west at the rate of 12 miles per hour, and the latter with an additional force of from 3 to 4 miles."

In the third session of the Forty-sixth Congress in the United States, a special committee of the House of Representatives, charged with the duty of studying all questions relative to transit across the ithsmuses of Mexico and Central America, after investigating the matter minutely, reported in favor of the project of Mr. Eads, and selected the Tehuantepec Route. The following is an extract from the respective report:

"Mr. Eads has selected the Isthmus of Tehuantepec and our Commission finds and thus reports, without vacilation, that of all the routes that of Tehuantepec is essentially American. A glance at the map will demonstrate the exactitude of this assertion. If a vassel leaving the mouth of the Mississippi, destined for California or the Orient, were to cross the Isthmus of Tehuantepec, the voyage would be 1,250 miles shorter than if it crossed at Panamá. If a vessel leaving New York, with the same destination, were to cross the Isthmus of Tehuantepec, its voyage would be 750 miles shorter than if it were to go via Nicaragua, and 1,250 miles less than via Panamá. And since such a considerable economy of distance principally affectes the commerce of this country and Mexico, and not the commerce of Europe, it is at once evident that the construction of a way for transit at Tehuantepec is of vital importance to the mercantile interests of the United States.

The shortening of the distance signifies cheapness of transportation. In Panamá as well as in Nicaragua, there reign calms at various periods of the year to such a degree, as to diminish considerably the utility of either of the two ways for sailing vessels. This does not happen, however, in Tehuantepec, where favorable winds ever blow, which is a garanty that no serious detention will be suffered by sailing vessels seeking passage through this route."

We will not close this chapter, without reproducing also some valuable data which we find in the report addressed by the distinguised Engineer, Mr. J. J. Williams, on the 10th. day of September, 1870, to Mr. Simon Stevens, of New York, President of what was called "Tehuantepec Railway Company." Mr. Williams was the Chief Engineer of the Commission named to fix the line of the Tehuantepec Railway. The first paragraph of that report reads thus.

"Sir: Pursuant to your instructions, I proceeded to the Isthmus of Tehuantepec, in company with Col. Eduardo Garay, the Mexican Commissioner, for the purpose of establishing the location of the line of the Tehuantepec Railway. Those instructions directed me also to obtain as much additional information as time would permit regarding the feasibility of a Ship Canal. I herewith submit my report, and beg to mention that I have ascertained facts, which, in my opinion, ought definitely to settle the question of its proper location. I consider Tehuantepec the proper place for an interoceanic Ship Canal, for the following reasons."

Mr. Williams then explains the reasons upon which he founds that assertion, notwithstanding the fact that his plan for the opening of the canal required the construction of 130 locks; but we will not endevour to reproduce here in whole those reasons, in as much as they refer to a proyect that could not be realized, and to a different plan altogeather to that formed by Messrs Carrillo de Albornoz and del Río. We cannot however forbear from asking ourselves this question:

If Mr. J. J. Williams, after a long and conscientious study, resolutely recomended the opening of an interoceanic canal across the Isthmus of Tehuancepec, *even when this exacted the construction of 130 locks*, what would he have done if he had had the fortune to encounter the pass or passes indicated in our present project, which renders manifest the facility with which that canal can be to-day constructed, *without even a single lock?*

Mr. Williams continues his report as follows:

"As to the harbors on the Pacific, the lagoons can be made into one of the best in the world. Boca Barra, the outlet of the lower lagoonto the sea, can be deepened to the required depth by dredging and by utilizing the outward currents. A few of the large steam dredges, such as were used on the Suez Canal, would easily do the work. In other words, if Mons. Lessepscan excavate and dredge his canal some fifty miles through the lagoons and sands of Arabia, we ought, certainly to find no difficulty in deepening the lagoons of Tehuantepec.

The Isthmus belongs, in its greatest part, to the State of Oaxaca, which has a population of 600,000, and the res to the State of Veracruz, which has 300,000, and is bounded on the east by the State of Chiapas, which has 200,900. In these three States alone, from 8,000 to 10,000 good and hardy acclimated laborers, who are superior in strength and morality to the Chinese, can be had for less than 50 cents per day of 12 hours, and they board themselves; besides, labor, to any extent that can be utilized, may be had from other parts of Mexico.

The Tehuantepec Ship Canal, above all others, is the one in which the United States is the most directly interested. It debouches into the Gulf of Mexico, our own Mediterranean, and, it may almost be said, right at our very doors.

It is alleged by reliable statisticians, that the United States alone loses 35.000,000 dollars every year for the want of it—thus giving a principal of nearly six hundred millions of dollars, onehalf of which, at least our government could affored to expend in its construction.

It is only necessary to look atamap of the world to be convinced of the immense relative advantages in position, above all others, which a ship canal across the Isthmus of Tehuantepec would offer to the commerce of the world, and more especially to that of the United States.

By this rout the products of the valley of the Mississippi may be shipped from the gulf ports direct for China, Japan, west coast of North and South America, and the islands of the Pacific, and the imports from those countries may be brought home to the ports of Texas, New Orleans, Mobile, Pansacola, and from thence transhipped to Memphis, Cairo St. Louis, Louisville and Cincinnati, and be distributed throughout the Southern and Western States, even to the frontier of British America, at one-third the cost of transportation of the same articles by the Pacific Railway. In a word, the completion of the ship canal across Tehuantepec, will not only open a direct outlet from the Gulf of Mexico and the Atlantic to India and China, but also from the Misissippi River and tributaires, whereby the sea going vessels plying upon those waters will be able to proced with safety to any port on the Pacific; thus giving to St. Louis, the Queen city of the West, and the whole Valley of the Mississippi, direct water communication with the Pacific side of North, Central ane South America. In a word the completion of the Tehuantepec Ship Canal would be the opening of the mouth of the Mississippi River into the Pacific Ocean—another world of waters.

The following statement, condensed from official tables, shows the saving to the trade of the world, in insurance on vessels and cargoes, profits on time saved, interest on cargoes, saving of wear and tear of ships, saving of wages, provisions etc., by using the Tehuantepec Canal.

United States..............	$	35.995,930 00
England..................		9.150,348 00
France....................		2.183,930 00
Other countries...........		1.400,000 00
Total yearly saving....	$	49.530,208 00

If the trade increases annually ten per cent, or one hundred per cent. in the next decade, the saving to the world will then be double the above amount.

As the annual increase of the trade of Great Britain, France, and the United States, is, together, more than ten per cent., the saving to the maritime powers of the world of $49.530,208.00 in one year, at the end of ten years will be $99.060,416. Assuming the trade only of the theree powers to increasse in the same proportion, the aggrepate total amount saved, at the end of ten years, will be over seven hundred millions of dollars.

Suppose the average tonnage of ships to be 1,000 tons each, then, as per the tables in this report, 3,049 ships would be requisite to carry the freight which would now annually seek the Isthmus route. Abert, estimating for Darien or Panamá, makes the annual saving for each ship $15,420.00, giving as the aggregate saved upon the tonnage which would pass the Isthmus the sum of $47.709,480; and the saving of one year, at the end of ten years, would be $95.418.960, sums sufficiently near the first to establish their correctness.

Again, by a comparison of time and money, in the pasage of a 1,000 ton ship from New York to California via Cape Horn with what it would be by way of Tehuantepec, it is estimated that the saving on the ship and cargo would be 13,300 dollars, or $13.30 per ton, against a toll not to exced $2.50 per ton. Allowing the ship to make but four trips per annum, of 45 days each, via the canal, it would give a yearly saving of 53,200 dollars. Deducting 10,000 dollars, the toll on the four trips, there results a net annual saving on a single one thousand tons ship of 43,200 dollars.

Whale ships and coasting vessels have been estimated generally at forty dollars per ton. The United States and European commerce around the capes, is conducted in first–class ships, which often cost eighty dollars per ton. Fifty dollars has therefore been taken as a fair overage value, in the construction of these tables, which do not inciude coasting trade nor the trade of any of the powers of the world, except England, France, and the United States

The following tables show the trade of the United States, England and France, which would probably pass through the Isthmus Canal if now finished, taken from the official returns of 1857 and 1858.

TRADE OF THE UNITED STATES which must pass through the Canal.

Countries traded with	Tonnage.	Exports and imports
Alaska.	5,735	$ 126,537
Dutch East Indies,.	16,589	904,550
British Australia and N. Zeland. .	52,105	4.728,083
British Fast Indies	177,121	11.744,131
French East Indies.	3,665	98,432

Countries traded with.	Tonnage.	Exports and imports.
Half of Mexico	34,673	9.601,063
Half of New Granada	131,708	5.375,354
Central America	36,599	425,081
Chili.	63,749	6.645,634
Peru	193,131	716,679
Ecuador	1,979	48,979
Sandwich Islands	33,876	1.157,849
China	123.578	12.752,062
Other Ports in Asia and Pacific	4,549	80,143
Whale Fisheries	116,730	10.796,090
California to East United States	861,698	35.000,000
Value of cargoes		$100.294,687
Total tonnage at $50 per ton	1.857,485	
Value of ships and cargoes		92.874,250
Total value of ships at $ 50 per ton.		$193.168,937

TRADE OF FRANCE which would pass through the Canal.

Countries traded with.	Tonnage	Exports and imports
Chili	25,688	$ 10.000,000
Peru	35,096	13.160,000
Half of Mexico	10,004	2.790,000
Half of New Granada	2,389	1.090,000
Ecuador	1,650	440,000
Bolivia	1,000	100,000
California	8,997	2.073,859
China—Outward only	2,028	2.180,000
Dutch East Indies—Outward only.	20,400	4.440,000
Sandwich Islands	4,119	2.000,000
Phillipine Islands	1,463	1.000,000
Australia	50,000	19.800,000
Value of cargoes		$ 59.073,859
Total tonnage	162,735	
Value of ships at $ 50 per ton		8.136,750
Total value of ships and cargoes		$ 67.210,609

TRADE OF ENGLAND which would pass through the Canal.

Countries traded with.	Tonnage.	Exports and imports.
Half of Mexico	11,833	$ 2.775,137
Half of Central America	5,615	1.244,817
Half of New Granada	10,188	2.437,605
Chili	118,311	15 486,110
Peru	244,319	20.473,520
Ecuador	1,820	360,015
China—Outward only	68,530	7.077,390
Java—Outward only	16,003	3.821,410
Singapore—Outward only	16,500	4.364,070
Australia	522,426	78.246,095
Sandwich Islands	1,950	520,560
California	11,800	2.378,105
Value of cargoes		$139.184,834
Total tonnage	1.029,295	
Value of ships at $ 50 per ton		$ 51.464,750
Total value of ships and cargoes		$190.649,584

The value of the tonnage which would take the Tehuantepec Route is, according to the above tables:

United States $	92.874,250
England	51.464,750
France	8.136,750
$	152.475,750

TOTAL VALUE OF EXPORTS AND IMPORTS taking the same route is:

United States $	193.168,937 00
England	190.649,584 00
France	67.210,609 00
Total value of trade of the three powers passing the Isthmus $	451.029,132 00

ESTIMATED TONNAGE to pass through the canal:

United States	1.857,485
England	1.029,295
France	162,735
Total tonnage	3.049,515

Upon the above tonnage, the yearly income, at $2 per ton, would be $ 6.099,030.00 which is the estimated annual gross receipts from tolls upon ships belonging to the United States, England and France.

This calculation does not include the United States coasting trade on both oceans, nor the trade that might be expected from the other nations of the world not mentioned.

The amount of $ 2,500 toll, now charged on a ship of 1,000 tons, on the Suez Canal, would increase the above estimated yearly income on Tehuantepec, to $ 7.625,000.00 This amount based upon the yearly ten per cent, increase would double itself in ten years.

In 1860, the maritime movement betwen *Europe alone* and the East, by way of the Cape of Good Hope, amounted to 7.250,000 tons. The ascertained rate of progress would give for 1870 á total of 11.000,000 tons, one half of which, at least, would pass through the Suez Canal and possibly a fifth by way of the American Isthmus.

Taking these facts into consideration, and bearing in mind that none of the trade of the Western Hemisphere is included in the 11.000,000 tons, it remains for commercial men to say whether or not we are correct in estimating an annual amount of 3.000,000 tons as likely to pass through the American Isthmus."

We must remind the reader, that since Mr. J. J. Williams made the calculations to which we have herein refered, 32 years have transpired, and that during that period of time the increase in the business of both worlds has been remarkable.

After citing such highly authorized opinions, it seems useless to add anything else to render clear and comprehensible, the supremacy that the Mexican Isthmus of Tehuantepec must always possess over those of Nicaragua and Panamá, for the establishment of that maritime interoceanic communication, which in such a direct manner affects the commercial interests of Asia, America and Europe in general, and of the United States and Mexico in particular. We will only further state, that application has just been made to the Government of Mexico, in due form, for the concession necessary to carry this grandiose work to a successful issue, and that all possible efforts will be employed, in order that the Great Interoceanic Canal of America may be inaugurated on the 16th of September, 1910, Centenary of the Mexican Independence.

COMPARATIVE TABLE OF DISTANCES

FROM NEW YORK TO HONG-KONG.

ROUTES.	Total Distance in Miles.	Miles in favor Santa Ana Route.
Via Cape Horn	20,379	8,750
,, Cape of Good Hope	16,945	5,316
,, Suez Canal	13,596	1,967
,, Panamá Railway	12,953	1,324
,, Interoceanic Canal of Mexico	11,629	

FROM NEW YORK TO YOKOHAMA.

Via Cape Horn	19,802	9,769
,, Cape of Good Hope	18,085	8,052
,, Suez Canal	15,527	5,494
,, Panamá Railway	11,256	1,223
,, Interoceanic Canal of Mexico	10,033	

FROM NEW YORK TO AUCKLAND, N. Z.

Via Cape Horn	16,871	7,420
,, Cape of Good Hope	16,719	7,268
,, Suez Canal	13,890	4,439
,, Panamá Railway	10,305	854
,, Interoceanic Canal of Mexico	9,451	

From New York to Melbourne.

ROUTES.	Total Distance in Miles	Miles in favor Santa Ana Route
Via Cape Horn	15,215	4,123
,, Suez Canal	15,171	4,079
,, Cape of Good Hope	15,019	3,927
,, Panamá Railway	11,826	734
,, Interoceanic Canal of Mexico	11,092	

From New York to Honolulu.

Via Cape Horn	15,826	9,136
,, Panamá Railway	7,939	1,249
,, Interoceanic Canal of Mexico	6,690	

From New York to San Francisco.

Via Cape Horn	15,687	10,770
,, Panamá Railway	6,063	1,146
,, Interoceanic Canal of Mexico	4,917	

From Liverpool to Hong-Kong.

Via CapeHorn	20,606	5,326
,, Panamá Railway	16,471	1,191
,, Cape of Good Hope	15,722	442
,, Interoceanic Canal of Mexico	15,280	

From Liverpool to Yokohama.

Via Cape Horn	19,400	5,918
,, Cape of Good Hope	17,653	4,171
,, Panamá Railway	14,540	1,058
,, Interoceanic Canal of Mexico	13,472	

From Liverpool to Auckland, N. Z.

Via Cape of Good Hope	16,221	3,385
,, Suez Canal	14,645	1,809

From Liverpool to Auckland, N. Z.

ROUTES	Total Distance in Miles	Miles in favor Santa Ana Route
Via Cape Horn	13,897	1,061
,, Panamá Railway	13.312	476
,, Interoceanic Canal of Mexico	12,836	

From Liverpool to San Francisco.

Via Cape Horn	15,803	7,500
,, Panamá Railway.	8,885	582
,, Interoceanic Canal of Mexico	8,303	

From New Orleans to Hong-Kong.

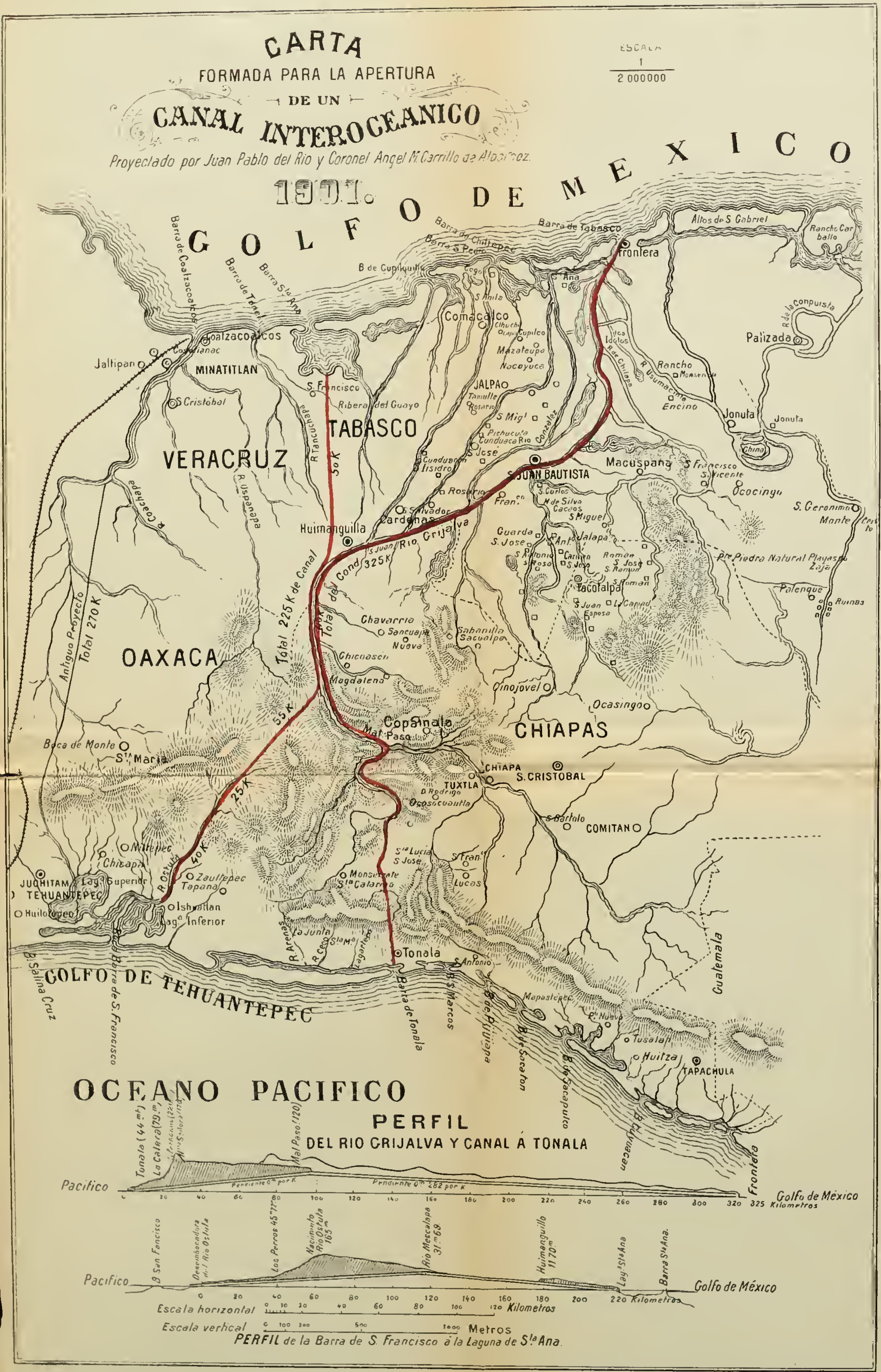
Via Cape Horn	20,804	10,504
,, Cape of Good Hope	17,485	7,185
,, Suez Canal	15,108	4,808
,, Panamá Railway	12,308	2,008
,, Interoceanic Canal of Mexico	10.300	

From New Orleans to Yokohama.

Via Cape Horn	20,227	11,563
,, Cape of Good Hope.	18,625	9,961
,, Suez Canal.	17,039	8,375
,, Panamá Railway.	10,611	1.947
,, Interoceanic Canal of Mexico	8,664	

From New Orleans to Auckland, N. Z.

Vía Suez Canal	18.381	10,259
,, Cape of Good Hope.	17,259	9,137
,, Cape Horn	14,314	6,192
,, Panamá Railway.	9,659	1,537
,, Interoceanic Canal of Mexico.	8,122	



CARTA
FORMADA PARA LA APERTURA
DE UN
CANAL INTEROCEANICO
Proyectado por Juan Pablo del Rio y Coronel Angel M. Carrillo de Albornoz.
1901.

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